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Agricultural Memorandum No 470

Expectancy of heavy winter rainfall - regression formulae

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The previous Agricultural Memoranda gave, on a regional basis, the smoothed expectancies of heavy rain for various average annual rainfalls.
The regression equations used in this smoothing are summarized in the Appendix together with their valid range of annual rainfalls.

Comments

The outstanding feature is the similarity of the regression coefficients.
The only consistent exceptions are:-

EAST - a smaller change with annual rainfall than in any other region. It is probable that this trend is also applicable to the lower rainfall end of the SOUTH EAST area - in other words there is little difference in climatic behaviour between south Essex and north Kent.

SOUTH-EAST - a larger change with annual rainfall than elsewhere although the SOUTH WEST area is at times very similar. The net effect is that high ground (and high annual average rainfalls) in the area south of a line Gloucester to London tends to have the highest relative expectancy of heavy falls.

The wetter areas of Britain, the West Midlands, Wales and the Northwest, do not have outstanding high expectancies relative to the annual average. In fact the north-east, chiefly the West Riding, have higher risks for the same average. This is probably because large annual averages in the east occur at greater heights above sea level than in the west. Stations near sea level in the west rarely have annual averages below 750 mm; those in the east are as low as 550 mm. The implication is that high ground is more prone to heavy storms irrespective of annual average.

Nevertheless the change with annual average is constant enough to assume that it is uniform within the counties comprising an area.

Any comments or suggestions on this paper should be referred to the author.

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Formulae for heaviest falls on 1 day in 1 year (R= Average Annual Rainfall in mm)

East	0.015R + 8.3	Range:-	500-750 mm
South East	0.030R + 0.3		550-1000 mm
South West	0.022R + 6.1		800-1150 mm
South Midlands	0.022R + 4.2		600-850 mm
East Midlands	0.019R + 6.6		550-750 mm
West Midlands	0.024R + 1.9		625-1125 mm
North East	0.024R + 2.9		600-1200 mm
North West	0.023R + 1.9		800-1450 mm
Wales	0.022R + 4.3		725-1350 mm

Formulae for heaviest falls on 1 day in 2 years

East	0.017R + 10.8
South East	0.035R + 1.0
South West	0.028R + 5.4
South Midlands	0.024R + 6.7
East Midlands	0.019R + 10.8
West Midlands	0.028R + 3.3
North East	0.029R + 3.5
North West	0.027R + 2.8
Wales	0.024R + 6.3

Formulae for heaviest falls on 1 day in 10 years

East	0.022R + 15.6
South East	0.040R + 5.1
South West	0.035R + 8.5
South Midlands	0.026R + 13.2
East Midlands	0.023R + 17.6
West Midlands	0.034R + 7.9
North East	0.038R + 5.2
North West	0.037R + 1.9
Wales	0.025R + 15.1

Formulae for heaviest falls in 5 days in 1 year

East	0.049R + 4.5
South East	0.072R - 6.4
South West	0.062R + 0.1
South Midlands	0.055R + 0.9
East Midlands	0.038R + 11.8
West Midlands	0.055R - 1.5
North East	0.057R - 1.6
North West	0.051R + 0.4
Wales	0.048R + 6.9

Formulae for heaviest falls in 5 days in 2 years

East	0.052R + 8.5
South East	0.085R - 7.6
South West	0.070R + 1.8
South Midlands	0.069R - 2.1
East Midlands	0.048R + 11.7
West Midlands	0.067R - 3.4
North East	0.070R - 3.2
North West	0.055R + 5.6
Wales	0.054R + 9.3

Formulae for heaviest falls in 5 days in 10 years

East	0.059R + 16.3
South East	0.10R - 3.6
South West	0.082R + 7.3
South Midlands	0.082R + 1.9
East Midlands	0.077R + 4.9
West Midlands	0.082R - 1.0
North East	0.082R + 3.0
North West	0.073R + 2.6
Wales	0.062R + 15.9